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WO 01/05526 A1

(54) Title: CLEANING OF BEER LINES

(57) Abstract: A method and apparatus for cleaning a pipeline. The method comprises: a) providing a flow of a first fluid, such as water, through a conduit (1), at least one orifice opening (FO1, FO2) into the conduit, such that a second fluid is drawn through the orifice into the first fluid at a specified rate relative to the rate of flow of the first fluid, to provide a flow of a solution of the first fluid in the second fluid of predetermined concentration; b) supplying the flow of the solution through the pipeline; c) allowing such solution to remain static in the pipeline for a predetermined time; d) providing a flow of the first fluid through the conduit, while preventing the second fluid being drawn through the orifice into the conduit, thereby flushing the solution from the conduit without flushing the pipeline; and e) providing a flow of the first fluid through the conduit and the pipeline to flush the solution from the pipeline. In one embodiment the first fluid is water, the second fluid is detergent, and the pipeline is a beer dispense line.

CLEANING OF BEER LINES

The present invention relates to cleaning of beer lines. In this context the word "beer" includes ales, lagers, porters and stouts.

In particular the present invention relates to a method of and apparatus for cleaning beer lines.

It is industry standard that in premises serving beer, lines carrying beer from cellar (or other storage area) to bar dispense (or dispensing) pumps must be cleaned regularly, such as every seven days, to avoid build-up of yeast and bacteria in the lines. Failure to clean lines regularly results in beer having poor taste, appearance and odour. Traditional manual cleaning requires the lines to be filled with a detergent solution, allowed to soak for half an hour, and then vigorously rinsed. The process normally takes about three hours for an average size British licensed premises.

It is an object of the present invention to provide, at least in preferred embodiments, apparatus or equipment by means of which cleaning of beer lines can be automated and carried out in a much reduced time. To this end it is necessary to use a much stronger cleaning/detergent solution and, to avoid line damage, strictly control the strength of the solution and the length of time it is allowed to remain in the lines.

The invention is defined in the appended claims.

The invention is further described below by way of example with reference to the accompanying drawings, wherein:

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Figure 1 is a schematic diagram of apparatus according to the present invention as installed in a licensed premises; and

Figure 2 is a perspective view of a manifold of the apparatus of Figure 1.

Except as described below the apparatus shown in the drawings is installed in a cellar of the licensed premises.

Referring to Figure 1 of the drawings, the apparatus shown therein comprises a manifold.

As shown in Figure 2 of the drawings, the manifold consists of a solid block having a main, large diameter central channel or conduit 1 and three small diameter channels or orifices FO1, FO2 and FO3 opening into the central channel.

Referring back to Figure 1 of the drawings, the apparatus shown therein comprises a water reservoir 2 connected through a line to one end of the central channel 1 of the manifold. A shut-off valve V5 is provided in the line. The other end of the central channel 1 is connected to a pump P, which in turn is connected through a one-way valve V6 to one end of a ring main.

The channels FO1 and FO2 of the manifold are connected to respective lines provided with respective valves FV2 and FV3, these lines being connected to a common line provided with a valve FV1 and connected to a detergent bottle. At the inlet of the common line from the interior of the detergent bottle a filter F is provided. The channel FO3 is connected to a pressure switch PS4.

The water reservoir is connected through a valve 3 to water mains.

Beer dispense lines run from the cellar to main and subsidiary bars of the licensed premises.

The ring main is connectable, intermediate its ends, to ends of beer dispense (or dispensing) lines. For this purpose the ring main is provided with connectors or sockets engagable with connectors or sockets at the ends of the dispense lines in the cellar. Each dispense line is provided with a respective valve, such as valve V7, and, at its end in one of the bars, is provided with a dispense pump or tap.

The ring main is also connected, at its end remote from the pump P, to two parallel lines 18 and 19. The line 18 is provided with a manually operable valve 18. The line 19 is provided with a purge unit 20 consisting of a solenoid valve FV4.

Sensors and switches are associated with the reservoir and the detergent bottle, and with an operator interface in the cellar and in the main and subsidiary bars. All the sensors, switches and valves (except the valve in the line 18) of the apparatus are interfaced with a sequential program of a programmable logic controller (PLC), provided on a control panel in the cellar, by means of discrete input (DIN) and discrete output (DOT) channels. The control panel is provided with a keypad and a display both connected to the PLC.

The operator interface consists of command units (CU) provided in the cellar and in bars.

Switches operated by the command unit in the cellar are shown towards the left of Figure 1. Switches operated by the command units in the bars are shown towards the top right corner of Figure 1.

A cleaning programme or other programme can be selected on the control panel, whereby the PLC causes the same programme to be run on initiation of successive programmes until a different programme is selected.

The desired cleaning programme is selected having regard to build up for different products, delays in cleaning and other factors.

The respective taps of barrels, casks or kegs (hereinafter referred to as "barrels") of various beers (products) in the cellar are connected to the dispense pumps in the bars *via* a respective connector or socket on each barrel and a corresponding connector or socket on each of the beer dispense lines.

When a barrel has emptied, a drainage connection, in the form of a hose or waste pipe, in one of the bars, is attached to the dispense pump of the dispense line from the barrel. The hose or waste pipe is connected to a bar drain. In the bar the dispense pump of the dispense line is opened, and in the cellar the barrel is disconnected from its dispense line and the beer dispense line of the empty barrel is engaged with the corresponding connector on the ring main thereby to connect the ring main to the dispense line.

A button is then pushed on any one of the command units to initiate a cleaning cycle in accordance with a selected cleaning programme to clean the beer dispense line of the emptied barrel.

Cleaning programmes which may be selected include a standard cleaning cycle, an increased detergent cleaning cycle and an extended cleaning cycle (with or without increased detergent). Such programmes may include provision for selection of a single beer line to be cleaned or for cleaning of multiple beer lines.

The apparatus operates as described below, under the control of the PLC to effect the standard cleaning cycle or the increased detergent cleaning cycle, each of which takes about five minutes.

Pressure in the main channel 1 of the manifold is monitored through the channel FO3 by the pressure switch PS4.

#### **Water reservoir filling**

The water reservoir is filled with water from the water mains.

#### **First dispense line rinse**

The shut off valve V5 and the valve, such as valve V7, in the dispense line to be cleaned, are opened (the valves in the other dispense lines remaining closed throughout the cleaning cycle) and the ring main and the dispense lines are rinsed by pumping water, by means of the pump P, from the water reservoir through the shut-off valve V5, the manifold, and the dispense line to the bar drain, whereby the connected dispense line is rinsed, the line being cleared of any debris, and yeast deposits in the line loosened.

**Detergent bottle back flush**

With the valves, such as valve V7, in the dispense lines and the valve FV4 closed, the valves FV1 and FV3 open momentarily, with the pump P operating, whereby the lines from the detergent bottle to the manifold are pressurized. The pressure drives water briefly back through the filter F to dislodge any crystals of detergent that would otherwise cause the filter to become clogged and reduce flow of detergent solution in subsequent steps of the cleaning cycle.

**Detergent injection**

The valve FV1 and the valve, such as the valve V7, in the dispense line to be cleaned are opened and in the increased strength detergent cleaning cycle, but not in the standard cleaning cycle, the valve FV2 is also opened, whereby liquid detergent is drawn from the detergent bottle through the orifice FO1 and, if the valve FV2 is opened, through the orifice FO2 into the manifold where it mixes with water being drawn through the central channel of the manifold by the pump from the water reservoir to the ring main and thence to the beer dispense line. When the valve FV1 is opened the detergent mixed with the water in the central channel forms a detergent solution of normal strength, whereas when the valve FV2 is additionally opened the detergent mixed with the water in the central channel forms a relatively concentrated (e.g. double or triple strength as compared with when only the valve FO1 is opened) detergent solution. The detergent solution is pumped by the pump P through the one-way valve V6 and the ring main into the dispense line to be cleaned.

It will be appreciated that the pressure drops resulting from the difference between the suction at the inlet to the pump and the static heads in the reservoir and the detergent bottle, together with the diameters of the main and small channels in the manifold determine the respective flow rates of the water, through the valve V5 and the detergent through the valves FV1 and FV2 (if opened) to the manifold.

The PLC determines, in accordance with the cleaning programme selected whether or not both valves FV1 and FV2 are opened to enhance cleaning.

The diameters of the small diameter channels FO1 and FO2 in the manifold are determined such that, with the pressure drops pertaining, the relative flows of water and detergent into the manifold will yield detergent solution of the desired concentration (within a specified tolerance).

#### **Manifold back flush**

With the pump P switched on and valves FV1 and FV4 closed and valves V5 and V7 open, the valves FV2 and FV3 open for a short period. The pump thereby draws water from the reservoir to flush out the central channel and the small diameter channels FO1 and FO2 of the manifold.

#### **Soak period**

The pump P is switched off. The one-way valve V6 prevents reverse flow of detergent solution from the beer dispense lines and the ring main towards the pump and the ring main and the beer dispense line are left to soak in still (non-flowing) detergent solution for a specified period, such as three minutes.



### Second dispense line rinse

The same operations as in the first dispense line rinse are effected again to clear the dispense line being cleaned of detergent solution.

### Ring main rinse

With the pump P remaining switched on, the valve FV4 is opened and the dispense lines are isolated by closure of the valves, such as valve V7. The pump P pumps water from the reservoir 2 and thereby flushes residual traces of detergent solution from the ring main. Rinse water is pumped, by the pump from the reservoir through the ring main and the valve FV4 to the cellar drain to clear any residual detergent solution from the ring main.

Completion of the cleaning cycle is then signalled in the bars and in the cellar.

In the increased detergent cleaning cycle, each of the first dispense line rinse, the second dispense line rinse and/or the ring main rinse may be for a longer period of time than in the standard cleaning cycle.

The cellar connector of the cleaned dispense line is then manually removed from the ring main and connected to a new barrel.

The remaining rinse water in the dispense line is emptied through the waste pipe until beer is seen in a site glass on the tap connection. The waste pipe is then removed and beer can then be served.

The water reservoir ensures that once a cleaning cycle has begun it cannot be interrupted due to any interruption in the mains water supply.

The short duration of the cleaning cycle makes it practicable for beer dispense lines to be cleaned as respective barrels become empty. By cleaning each beer dispense line only when the respective barrel has emptied the normal beer loss or wastage of beer remaining in the beer dispense lines is avoided.

The extended cleaning cycle takes about ten minutes.

The extended cleaning cycle comprises like steps to the standard cleaning cycle and/or increased detergent cleaning cycle. It includes the steps described above up to and including the Soak period, followed by a shorter rinse (in the manner described above) of the dispense line, and then repetition of the Detergent Injection Step, the Manifold Back Flush Step, the Soak period, and then finally a rinse (in the manner described above) of the dispense line for an extended period of time.

More than one of the beer dispense lines from the same barrel may be cleaned simultaneously as described above, if desired, by selection of the appropriate multiple line programme on the keypad.

The valve in the line 18 is normally kept closed but opens at the end of each cleaning cycle to drain the ring main.

Greatly shortened cleaning time results from the high turbulence during rinsing and greatly increased detergent strength usable by means of the present invention.

Manual cleaning uses only normal water pressure and requires a half-hour soak: it uses only a 1% cleaning solution due to danger of line damage resulting from excess solution strength and/or timing errors. (The detergent is a mixture of sodium hydroxide and sodium hypochlorite capable of corroding most metals and plastics).

The PLC is programmable for lines needing more intense cleaning and rinsing between barrels to avoid fobbing, and cleaning lines when barrels are not empty. When a line requires cleaning but the barrel is not empty, beer can be dispensed until the line is empty without further beer being supplied from the barrel. The barrel is then disconnected from the dispense line and a cleaning cycle as described above is initiated.

The push button unit in the cellar enables staff not normally involved in operating the apparatus to stop the apparatus in an emergency or to start the cleaning cycle in accordance with the selected cleaning programme.

The display unit will indicate the stage a programme being carried out has reached and indicates audibly and visibly warnings of malfunctions. The PLC will cause an alarm to be sounded if a malfunction occurs and may stop the programme continuing.

## CLAIMS

1. A method of cleaning a pipeline comprising:
  - (a) providing a flow of a first fluid, such as water, through a conduit, at least one orifice opening into the conduit, such that a second fluid is drawn through the orifice into the first fluid at a specified rate relative to the rate of flow of the first fluid, to provide a flow of a solution of the first fluid in the second fluid of predetermined concentration;
  - (b) supplying the flow of the solution through the pipeline;
  - (c) allowing such solution to remain static in the pipeline for a predetermined time;
  - (d) providing a flow of the first fluid through the conduit, while preventing the second fluid being drawn through the orifice into the conduit, thereby flushing the solution from the conduit without flushing the pipeline; and
  - (e) providing a flow of the first fluid through the conduit and the pipeline to flush the solution from the pipeline.
2. A method according to claim 1, wherein the first fluids are both liquid.
3. A method according to claim 2, wherein the first liquid is water and the second fluid is detergent.
4. A method according to claim 3, wherein the pipeline is a beer dispense line.

5. A method according to any preceding claim wherein there are at least two of the orifices opening into the conduit, such that the solution is of respective predetermined concentrations depending upon through which of the orifices the second fluid is drawn.
6. A method according to any preceding claim, wherein whether the second fluid is drawn through only one orifice or through more than one orifice depends on which of a plurality of programme or cycles is manually selected on control means.
7. A method according to claim 6, wherein the total time period during which the second fluid is drawn through the orifice or orifices depends on which programme is manually selected on the control means.
8. Apparatus for cleaning a pipeline, comprising
  - (a) a conduit for connection to a supply of a first fluid and to the pipeline;
  - (b) at least one orifice opening into the conduit and for connection to a supply of a second fluid, such that a flow of the first fluid along the conduit draws the second fluid into the conduit in a predetermined proportion relative to the first fluid;
  - (c) means for closing a connection between the orifice and the supply of the second fluid; and
  - (d) means for opening and closing a connection between the conduit and the pipeline, whereby the conduit can be flushed by the first fluid, free of the second fluid, selectively with or without the first fluid flushing the pipeline.

9. Apparatus according to claim 8, wherein there are at least two of the orifices opening into the conduit and for connection to the supply of the second fluid, such that the second fluid can be drawn into the first fluid in the conduit in respective predetermined proportions depending upon through which of the orifices it is drawn.

10. Apparatus according to claim 9, further comprising control means on which a plurality of programme or cycles can be manually selected, the programmes or cycles including a first cleaning cycle wherein only a first of the orifices is open to allow the second fluid to be drawn into the conduit and a second cleaning cycle wherein a first of the orifices and a second of the orifices are both open to allow the second fluid to be drawn into the conduit at an increased rate as compared with its rate when only the first of the orifices is open.

11. A process according to claim 10, wherein the programme or cycles include a cycle wherein the total time period in which the second fluid is drawn into the conduit is relatively short and a cycle wherein such duration is relatively long.

12. A manifold for use in an apparatus according to claim 6, comprising a channel of relatively large cross section and at least one orifice opening thereinto, whereby a flow of first fluid through the channel draws a second fluid in a specified proportion relative to the first fluid into the channel.

13. A manifold according to claim 8, wherein there are at least two of the orifices for the second fluid to be drawn into the channel in respective specified proportions relative to the first fluid.

14. A method of cleaning a pipeline, substantially as described herein with reference to the accompanying drawings.

15. Apparatus for cleaning a pipeline, substantially as described herein with reference to and as illustrated in the accompanying drawings.

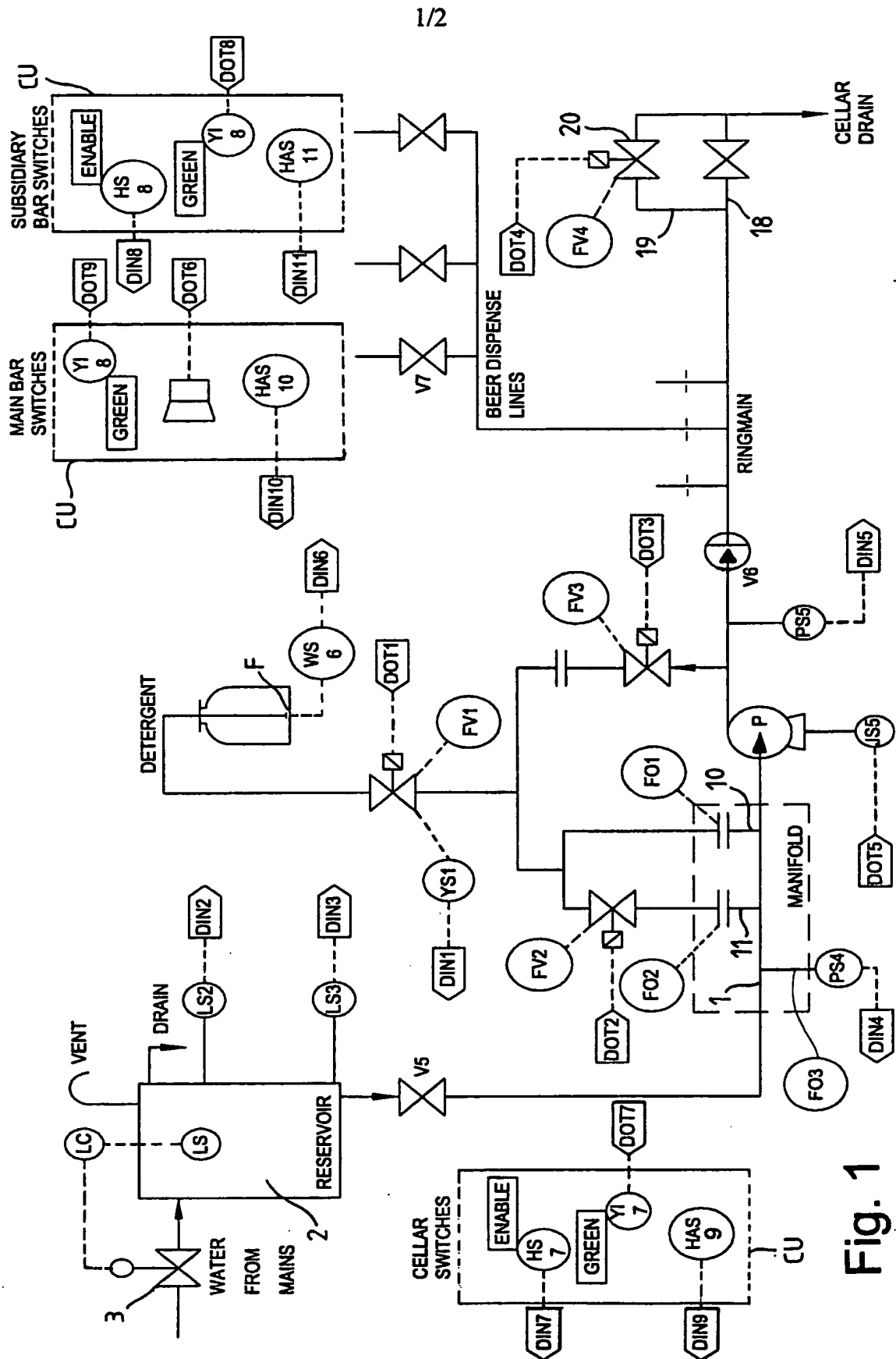


Fig. 1



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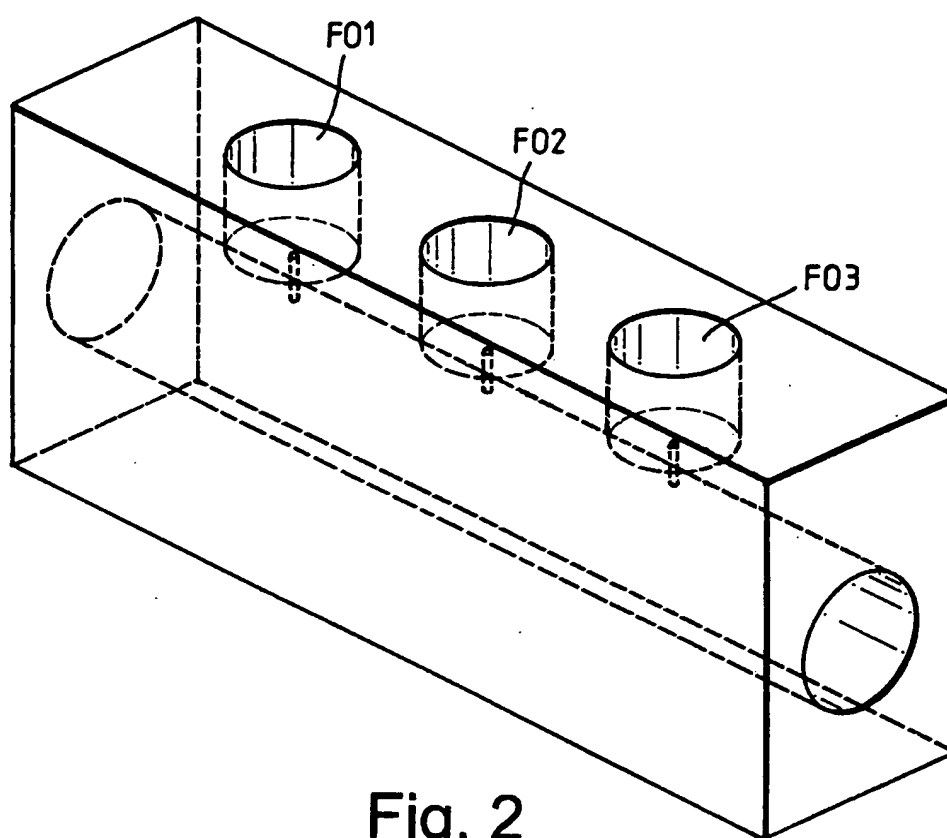


Fig. 2

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 00/02766

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B08B9/027 B67D1/07

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B08B B67D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 16 07 988 A (REICH) 5 February 1970 (1970-02-05) page 1, line 1 - line 3 page 3, line 16 - line 21 page 5, line 5 -page 6, line 19; figures	12
Y	-----	1-4,7,8
Y	BE 848 949 A (SILLIS) 1 April 1977 (1977-04-01) the whole document	1-4,7,8
A	----- US 5 858 114 A (BOARD ET AL) 12 January 1999 (1999-01-12) column 3, line 57 -column 6, line 62; figures	1-4,7,8, 12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

27 October 2000

Date of mailing of the international search report

06. 11. 00

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 00/02766

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☒ Claims Nos.: 14, 15  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 14, 15

Not allowable; rule 6.2 (a) PCT.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat. Application No

PCT/GB 00/02766

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 1607988 A	05-02-1970	NONE	
BE 848949 A	01-04-1977	NONE	
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